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NORTHEAST ELECTRONICS

A DIVISION OF NORTHERN TELECOM, INC.

INSTRUCTION MANUAL

26BXS

SF SIGNAL SYSTEM TEST PANEL

No. A0026-58-600 ISSUE 2 DATE FEB 1977

PRINTED IN U.S.A.

Airport Rd., Concord, N.H. 03301 • (603) 224-6511 • TELEX 94-3453

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SECTION 1

DESCRIPTION

1.1 A TTS 26BXS SF Signal System Test Panel, when used with a Model TTS 26B Pulse Signaling Test Set (or equivalent) extends the capabilities of the basic test set to include the sending and receiving of single frequency signals.

1.2 The Model TTS 26BXS-1 mounts as an accessory unit within the cover of a Model TTS 26B test set. The Model TTS 26BXSR mounts in a 19" rack. Both models are electronically the same.

1.3 The test panel can be sectionalized into two parts: (a) the send section which generates single frequency tones, and (b) the receive section which transforms single frequency tone bursts into dc pulsing.

1.4 The send section generates tones at 1kHz, 1.6 kHz, 2.4 kHz and 2.6 kHz. On special order, two additional frequencies may be added to Model TTS 26BXS-1 and one additional frequency may be added to Model TTS 26BXSR.

1.5 The on/off keying of any transmitted tone is normally under direct control of send circuits in a 26B series pulse signaling test set. The tone output level may be set in discrete steps between 0 dBm and −36 dBm. The send section has a 600-ohm output impedance.

1.6 The 1-kHz tone included in the send section may be used as a reference tone. This tone may be transmitted either continuously or on a pulsing basis as selected by a key switch. This feature can be used to activate or test the Model TTS 40A Loop Around Unit. The loop around unit requires a 1-kHz tone pulsed at a 20-Hz rate.

1.7 A key switch provides supervision functions. The ON HOOK position transmits a continuous SF tone while OFF HOOK position turns off the SF tone. The PULSE position allows a 26B series pulse signaling test set to control the test panel's send section.

1.8 The test panel's receive section contains amplifier and detector circuits to change incoming SF signaling tone bursts into dc pulsing. The dc pulsing is then applied to the receive section of a 26B series test set. This permits the percent break and pulsing speed of the incoming SF signaling to be measured by the 26B series pulse signaling test set.

1.9 The test panel's receive section can either terminate a circuit under test with 600 ohms or bridge the circuit. The receive section has two output jacks. One jack connects to a 26B series pulse signaling test set, and the other jack may be used for monitoring purposes . . . to operate a pen recorder, etc.

1.10 The test panel requires a filtered 48-Vdc power source; approximately 170 mA of current is needed to operate the test panel.

SECTION 2

SPECIFICATIONS

SEND SECTION

Send Frequencies;	1.0 kHz, 1.6 kHz, 2.4 kHz, and 2.6 kHz
Output Level:	selectable 0 dBm, −1 dBm, −13 dBm, −16 dBm, −20 dBm, −24 dBm, or −36 dBm
Output Impedance:	balanced 600 ohms, dc blocked
Frequency Stability:	better than 1% from 50°F to 100°F (10°C to 38°C)
Level Stability:	better than 0.25 dB from 50°F to 100°F (10°C to 38°C)
Distortion:	less than 1% for any harmonic component
Level Accuracy:	Better than 0.20 dB

RECEIVE SECTION

Input Impedance:	terminating: 600 ohms, dc blocked bridging: 50k ohms, dc blocked
Sensitivity:	−35 to −40 dBm
Receive Output:	dry contacts, reed relay (these contacts cannot drive high current or inductive circuits)
Spark Suppression:	none

PHYSICAL CHARACTERISTICS

Size:	TTS 26BXS-1	TTS 26BXSR
height	8" (20 cm)	3½" (8.9 cm)
width	4" (10 cm)	19" (48.3 cm)
depth	3¼" (9.5 cm)	5 1/8" (13 cm)
Weight:	2 lbs (0.9 kg)	5¼ lbs (2.4 kg)

SECTION 3

INSTALLATION AND OPERATION

3.1 INSTALLATION

3.2 The TTS 26BXS-1 test panel mounts within the accessory cover of a portable TTS 26B series pulse signaling test set. Normally, the test panel is factory installed in a cover and does not require field installation. Figure 3—1 shows the interconnections within the accessory cover.

3.3 The TTS 26BXSR test panel may be mounted on a 19" rack. After attaching the test panel, patch CO battery and ground to terminals 1 and 2 respectively of TB1. See Figure 3—2 for dimensions of the rack mounted test panel.

3.4 Terminal boards provide paralled access to the input and output jacks of the TTS 26BXSR test panel. These terminal boards are located behind the front panel and underneath the dust cover. See Figure 3—2 and 4—1 for location and interconnection data.

3.5 OPERATION

3.6 CONTROLS AND INDICATORS

3.7 Figures 3—3 and 3—4 show the controls and indicators of the TTS 26BXS-1 and TTS 26BXSR respectively. Table 3—1 describes the functions of these controls and indicators.

Table 3—1. Test Panel Controls And Indicators

TTS 26BXS-1		TTS 26BXSR		DESCRIPTION
REF DES	NOMENCLATURE	REF DES	NOMENCLATURE	
SEND SECTION				
		DS1	PWR OFF lamp	Lights to indicate presence of dc power with FREQ KC switch in any position other than PWR OFF. TTS 26BXS-1 does not have any power indication since it receives its power from the attached TTS 26B series test set.
J5	OUTPUT LINE jack	J2	SF OUTPUT (600 Ω) jack	Connects send section output to a circuit under test.
J6	TO TTS-26B SEND LOOP jack	J1	PULSING INPUT FROM TTS-26B SEND LOOP jack	Connects send section input to TTS 26B series test set send circuits. Test set controls operation of test panel if PULSE/OFF HOOK/ ON HOOK switch is set at PULSE
R5	SEND LEVEL ADJ potentiometer			Used during shop calibration to set the output level of the send section. TTS 26BXSR has a send level adjustment potentiometer behind the front panel.
S1	FREQ KC switch	S1	FREQ KC switch	Selects the send frequency. In the TTS 26BXSR, this switch also turns on the test panel.

Table 3—1. (Cont'd)

TTS 26BXS-1		TTS 26BXSR		DESCRIPTION
REF DES	NOMENCLATURE	REF DES	NOMENCLATURE	
S2	OUTPUT LEVEL switch	S2	OUTPUT LEVEL switch	Sets the send level.
S4	PULSE/OFF HOOK/ ON HOOK key switch	S4	PULSE/OFF HOOK/ ON HOOK key switch	Supervisory key switch, establishes on hook (steady SF tone), off hook (no SF tone), or SF tone pulsing (under control of 26B series test set).
RECEIVE SECTION				
DS1	SF GAIN lamp	DS2	SF GAIN lamp	Lamp flashes (only if PRESS TO CALL is held pressed) to indicate that the receive section has sufficient gain to drive its output stage. SF GAIN control R1 sets the gain of the receive section.
J1	TERM jack	J4	TERM (600 Ω) jack	Connects a circuit under test to the receive section on a 600-ohm terminating basis.
J2	BRDG jack	J3	BRDG (< 50K Ω) jack	Connects a circuit under test to the receive section on a bridging basis.
J3	TO TTS-26B REC LOOP jack	J5	TO TTS-26B REC LOOP jack	Connects the receive section output to a TTS 26B series test set receive circuits.
J4	MON jack	J6	MON jack	A jack connected in parallel with TO TTS-26B REC LOOP jack. May be used to drive an external recorder or other monitoring device.
R1	SF GAIN potentiometer	R1	SF GAIN potentiometer	Sets the receive section gain. After calibration, the control markings indicate the approximate input level of the incoming signal.
S3	PRESS TO CAL switch	S3	PRESS TO CAL switch	Causes the SF GAIN lamp to appear as the receive section's output load.

SECTION 3

INSTALLATION AND OPERATION

3.1 INSTALLATION

3.2 The TTS 26BXS-1 test panel mounts within the accessory cover of a portable TTS 26B series pulse signaling test set. Normally, the test panel is factory installed in a cover and does not require field installation. Figure 3—1 shows the interconnections within the accessory cover.

3.3 The TTS 26BXSR test panel may be mounted on a 19" rack. After attaching the test panel, patch CO battery and ground to terminals 1 and 2 respectively of TB1. See Figure 3—2 for dimensions of the rack mounted test panel.

3.4 Terminal boards provide paralled access to the input and output jacks of the TTS 26BXSR test panel. These terminal boards are located behind the front panel and underneath the dust cover. See Figure 3—2 and 4—1 for location and interconnection data.

3.5 OPERATION

3.6 CONTROLS AND INDICATORS

3.7 Figures 3—3 and 3—4 show the controls and indicators of the TTS 26BXS-1 and TTS 26BXSR respectively. Table 3—1 describes the functions of these controls and indicators.

Table 3—1. Test Panel Controls And Indicators

TTS 26BXS-1		TTS 26BXSR		DESCRIPTION
REF DES	NOMENCLATURE	REF DES	NOMENCLATURE	
SEND SECTION				
		DS1	PWR OFF lamp	Lights to indicate presence of dc power with FREQ KC switch in any position other than PWR OFF. TTS 26BXS-1 does not have any power indication since it receives its power from the attached TTS 26B series test set.
J5	OUTPUT LINE jack	J2	SF OUTPUT (600 Ω) jack	Connects send section output to a circuit under test.
J6	TO TTS-26B SEND LOOP jack	J1	PULSING INPUT FROM TTS-26B SEND LOOP jack	Connects send section input to TTS 26B series test set send circuits. Test set controls operation of test panel if PULSE/OFF HOOK/ ON HOOK switch is set at PULSE
R5	SEND LEVEL ADJ potentiometer			Used during shop calibration to set the output level of the send section. TTS 26BXSR has a send level adjustment potentiometer behind the front panel.
S1	FREQ KC switch	S1	FREQ KC switch	Selects the send frequency. In the TTS 26BXSR, this switch also turns on the test panel.

Table 3—1. (Cont'd)

TTS 26BXS-1		TTS 26BXSR		DESCRIPTION
REF DES	NOMENCLATURE	REF DES	NOMENCLATURE	
S2	OUTPUT LEVEL switch	S2	OUTPUT LEVEL switch	Sets the send level.
S4	PULSE/OFF HOOK/ ON HOOK key switch	S4	PULSE/OFF HOOK/ ON HOOK key switch	Supervisory key switch, establishes on hook (steady SF tone), off hook (no SF tone), or SF tone pulsing (under control of 26B series test set).
RECEIVE SECTION				
DS1	SF GAIN lamp	DS2	SF GAIN lamp	Lamp flashes (only if PRESS TO CALL is held pressed) to indicate that the receive section has sufficient gain to drive its output stage. SF GAIN control R1 sets the gain of the receive section.
J1	TERM jack	J4	TERM (600 Ω) jack	Connects a circuit under test to the receive section on a 600-ohm terminating basis.
J2	BRDG jack	J3	BRDG (< 50K Ω) jack	Connects a circuit under test to the receive section on a bridging basis.
J3	TO TTS-26B REC LOOP jack	J5	TO TTS-26B REC LOOP jack	Connects the receive section output to a TTS 26B series test set receive circuits.
J4	MON jack	J6	MON jack	A jack connected in parallel with TO TTS-26B REC LOOP jack. May be used to drive an external recorder or other monitoring device.
R1	SF GAIN potentiometer	R1	SF GAIN potentiometer	Sets the receive section gain. After calibration, the control markings indicate the approximate input level of the incoming signal.
S3	PRESS TO CAL switch	S3	PRESS TO CAL switch	Causes the SF GAIN lamp to appear as the receive section's output load.

3.8 USING THE TTS 26BXS SERIES TEST PANEL

3.9 The following procedure outlines a typical sequence of steps to send and receive SF signaling. Figure 3—5 shows a typical test setup.

1) Zero adjust the 26B series pulse signaling test set.

a) With no power applied to the 26B series test set, check that the meter reads 100 ± 0.5 percent. Adjust the meter screw as necessary.

b) After an adjustment, back off the adjustment screw slightly to remove mechanical contact between the screw and the meter mechanism.

2) Power up and full scale adjust.

a) Connect the accessory cover adapter cable to the 26B series test set adapter jack (TTS 26BXS-1 test panel only).

3) Interconnect the test panel.

a) On the 26B series test set, position these switches as follows:

SEND key switch at RT on 1 + 2;
RECEIVE switch fully clockwise;
SEND or SEND AND RECEIVE switch at SEND LOOP REC LOOP;
METER CIRCUIT switch at % BREAK DIRECT;
SPARK SUP switch at OFF

b) Patch the test panel and test set as follows (see Figure 3—5):

Test panel TO TTS-26B REC LOOP jack to test set REC LOOP jack;
Test panel TO TTS-26B SEND LOOP jack to test set SEND 1 or SEND 2 jack.

c) Patch the test panel to SF circuit under test. Select either the TERM or BRDG input jack as required.

NOTE

The TTS 26BXSR panel names for the jacks and controls differ slightly from the names on the TTS 26BXS-1 test panel. Refer to Table 3—1 for cross reference between the two test panels.

d) Insert the 310-type plug of a power supply patch cord into one of the 26B series test set 48 VOLTS jacks. Observe that correct polarity is maintained.

e) Connect the other end of the power cord to a 48 Vdc source.

NOTE

If using a power source other than CO battery, connect a jumper between the test set GND binding post and CO ground.

f) On test panel (TTS 26BXSR only), set FREQ KC at any position other than PWR OFF.

g) On 26B series test set, set SEND PPS switch at any position other than PWR OFF.

h) Set 26B series test set FUNCTION switch at CAL MTR and adjust METER CAL control to obtain 0 ± 0.5 percent on the meter.

NOTE

The test set should be used in the position that it was calibrated, either vertically or horizontally.

4) Adjust the send signaling.

a) On the test panel, set OUTPUT at desired level.

b) Select a frequency using the FREQ KC switch.

c) On the test set, set FUNCTION switch at ADJ % BREAK.

d) Set SEND PPS switch for desired pulse speed.

e) Set FUNCTION key switch at SEND OSC.

f) Set ADJUST % BREAK control for desired percent break as indicated on meter.

NOTE

Recheck percent break if pulse speed is changed, readjust as necessary.

g) Set FUNCTION switch at SEND & REC.

5) Adjust the SF gain.

a) On the test panel, set the keyswitch at PULSING.

b) Hold the PRESS TO CAL pushbutton down.

c) Set the SF GAIN control at 1 and adjust the gain control until the SF GAIN lamp flashes.

d) Release the PRESS TO CAL pushbutton.

6) Calibrate the 26B series test set meter.

a) On the test panel, set the key switch at OFF HOOK.

b) On the test set, set FUNCTION switch at CAL MTR.

c) Adjust METER CAL control to obtain 0 ± 0.5 percent on the meter.

d) Set FUNCTION switch at SEND & REC.

e) On the test panel, set the keyswitch at PULSING.

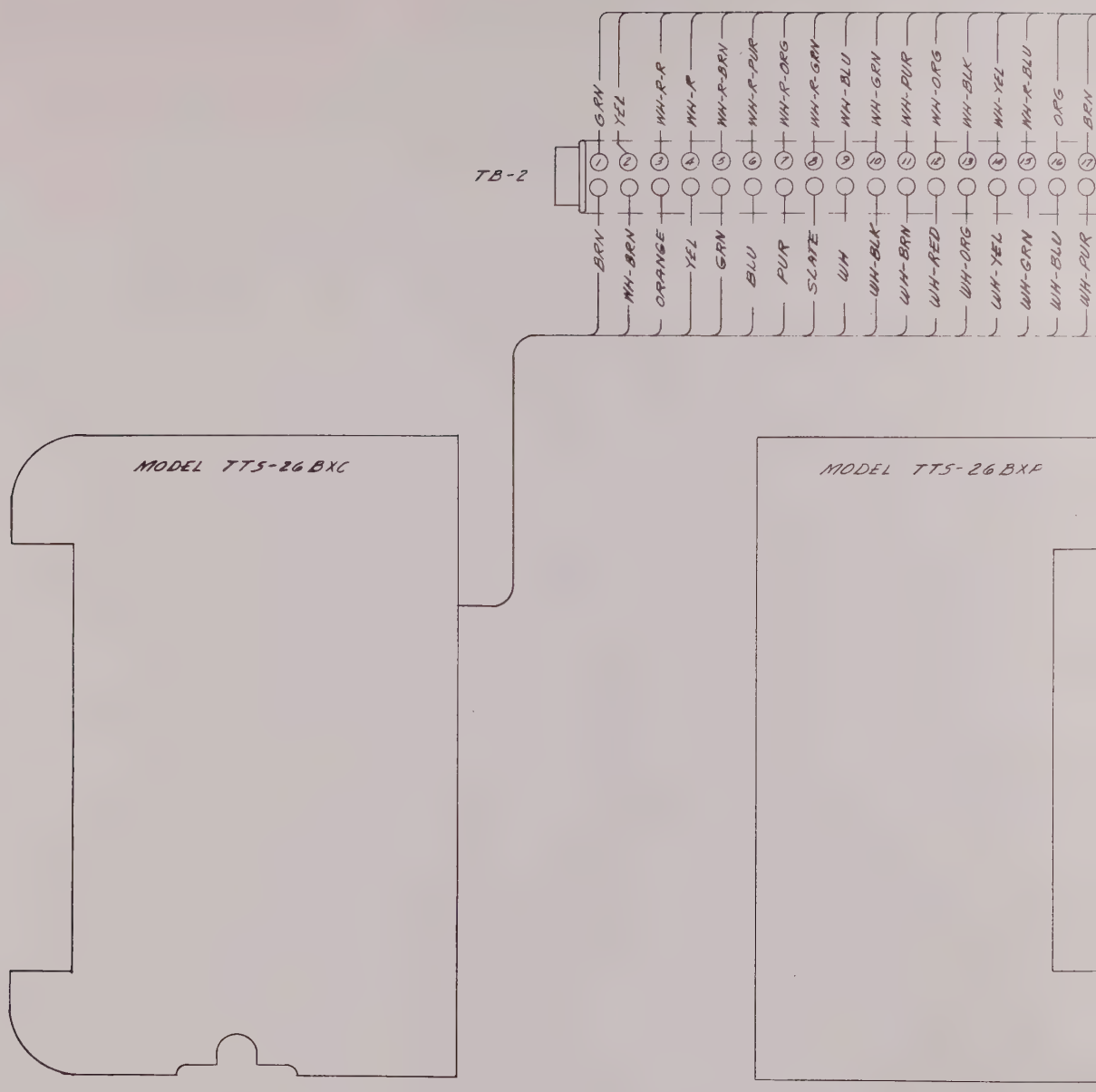
7) Measure the incoming signal.

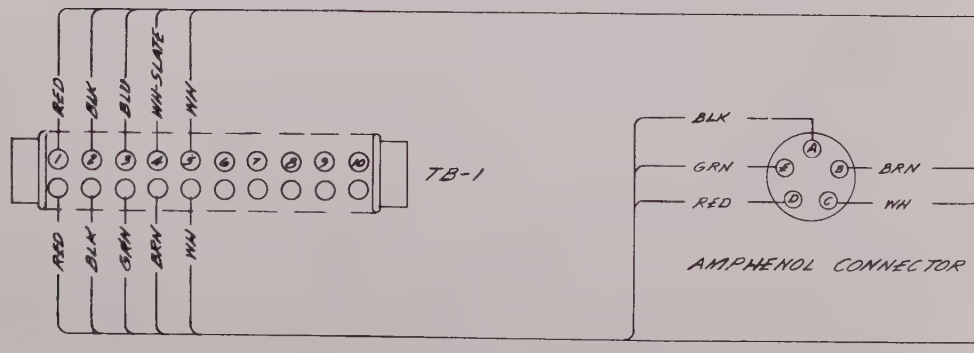
a) Read meter % BREAK scale for percent break measurement.

b) For pulse speed measurement set METER CIRCUIT switch at 0-25 PPS and read meter PPS scale.

NOTE

The setting of the test panel SF GAIN control represents the approximate level (in −10 dB increments) of the incoming SF signal.


TB-2
GRN
YEL
WH-BRN
WH-R-R
WH-R
WH-R-BRN
WH-R-PUR
WH-R-ORG
WH-R-GRN
WH-BLU
WH-GRN
WH-PUR
WH-ORG
WH-BLK
WH-YEL
WH-GRN
WH-BLU
ORG
BRN
WH-PUR
BRN
ORANGE
YEL
GRN
BLU
PUR
SLATE
WH
WH-BLK
WH-BRN
WH-RED
WH-ORG
WH-YEL
WH-GRN
WH-BLU
WH-PUR
MODEL TTS-26BXC
MODEL TTS-26BXF


RED
BLK
BLU
WH-SLATE
WH
TB-1
RED
BLK
GRN
BRN
WH
BLK
GRN
RED
BRN
WH
AMPHENOL CONNECTOR

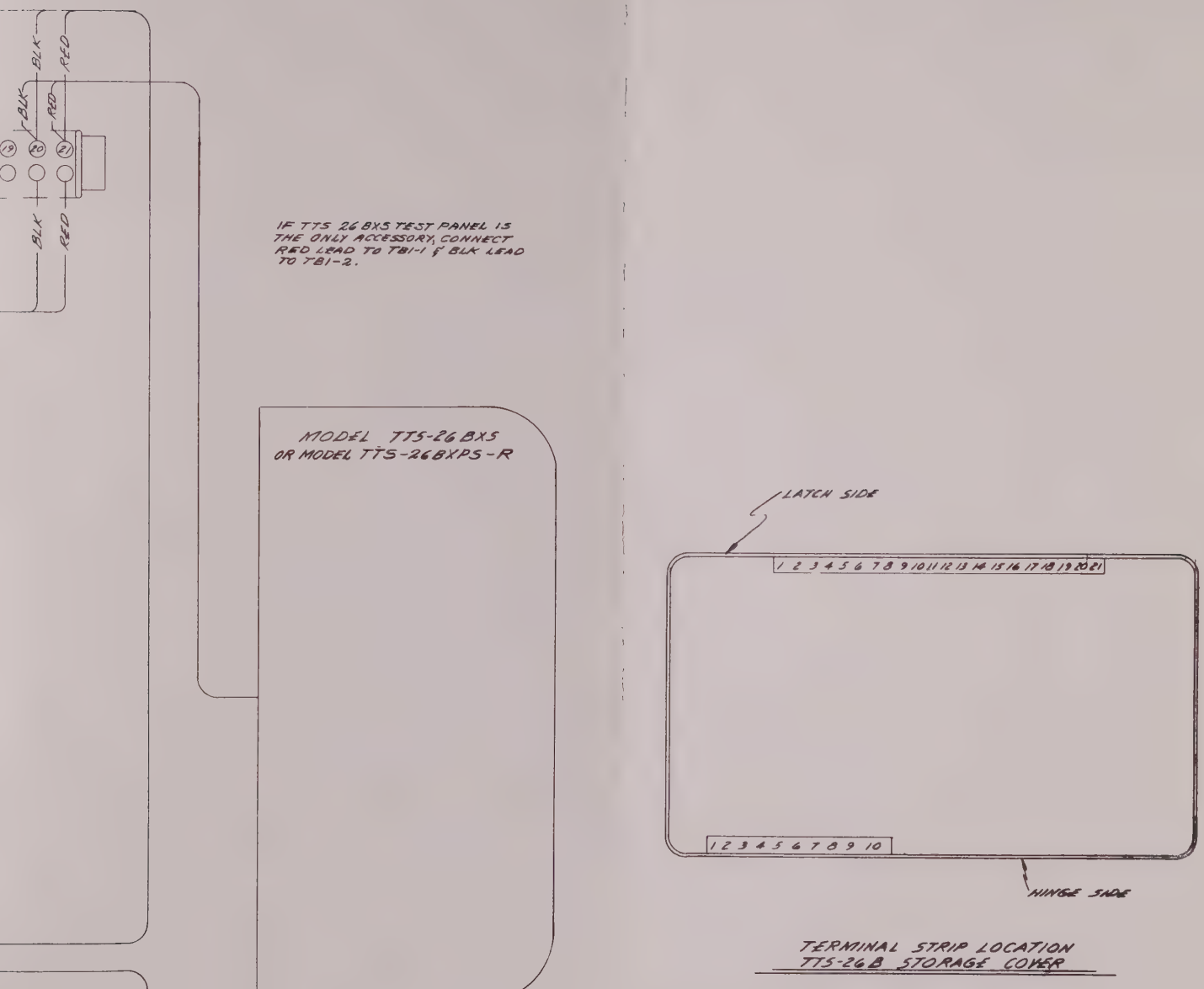

BLK
RED
BLK
RED
19
20
21
BLK
RED
IF TTS 26 BXS TEST PANEL IS THE ONLY ACCESSORY, CONNECT RED LEAD TO TB1-1 & BLK LEAD TO TB1-2.
MODEL TTS-26 BXS OR MODEL TTS-26BXPS-R
LATCH SIDE
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
1 2 3 4 5 6 7 8 9 10
HINGE SIDE
TERMINAL STRIP LOCATION
TTS-26B STORAGE COVER

Figure 3—1. Accessory Cover Interconnections.

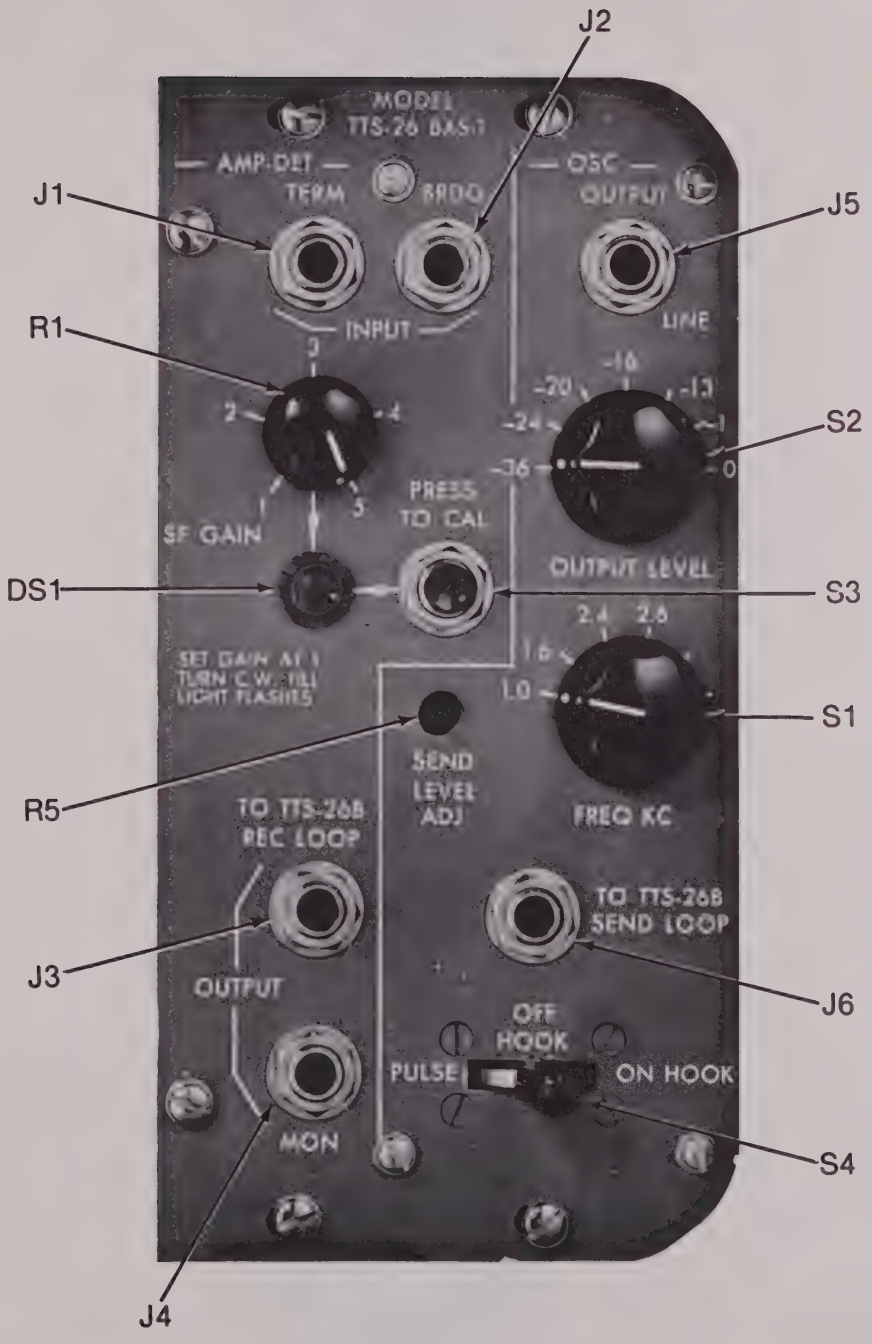


Figure 3—3. TTS 26BXS-1 Controls and Indicators.

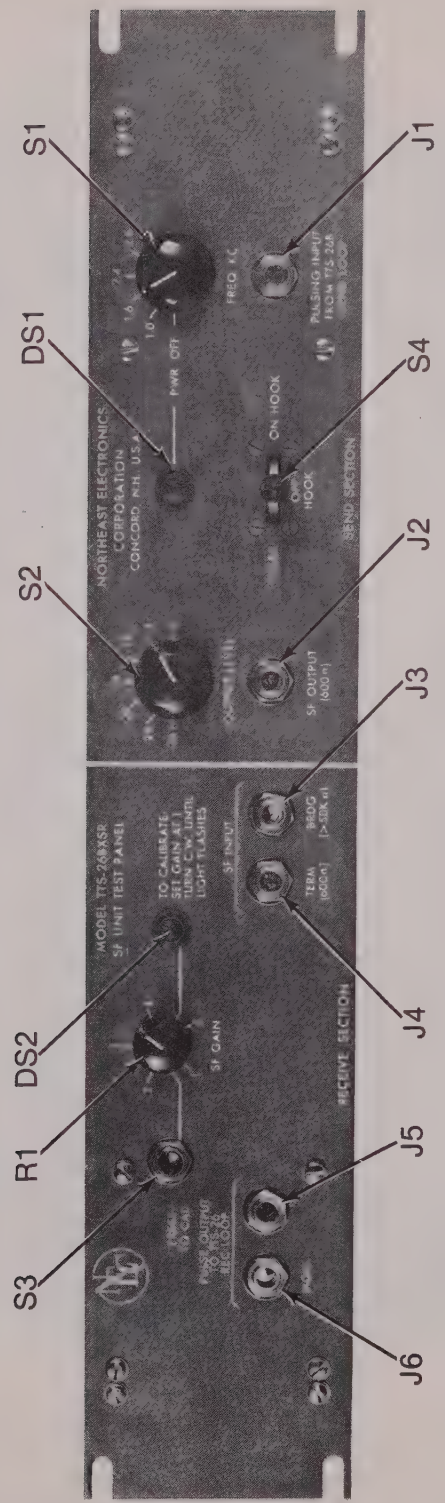


Figure 3—4. TTS 26BXSR Controls and Indicators.

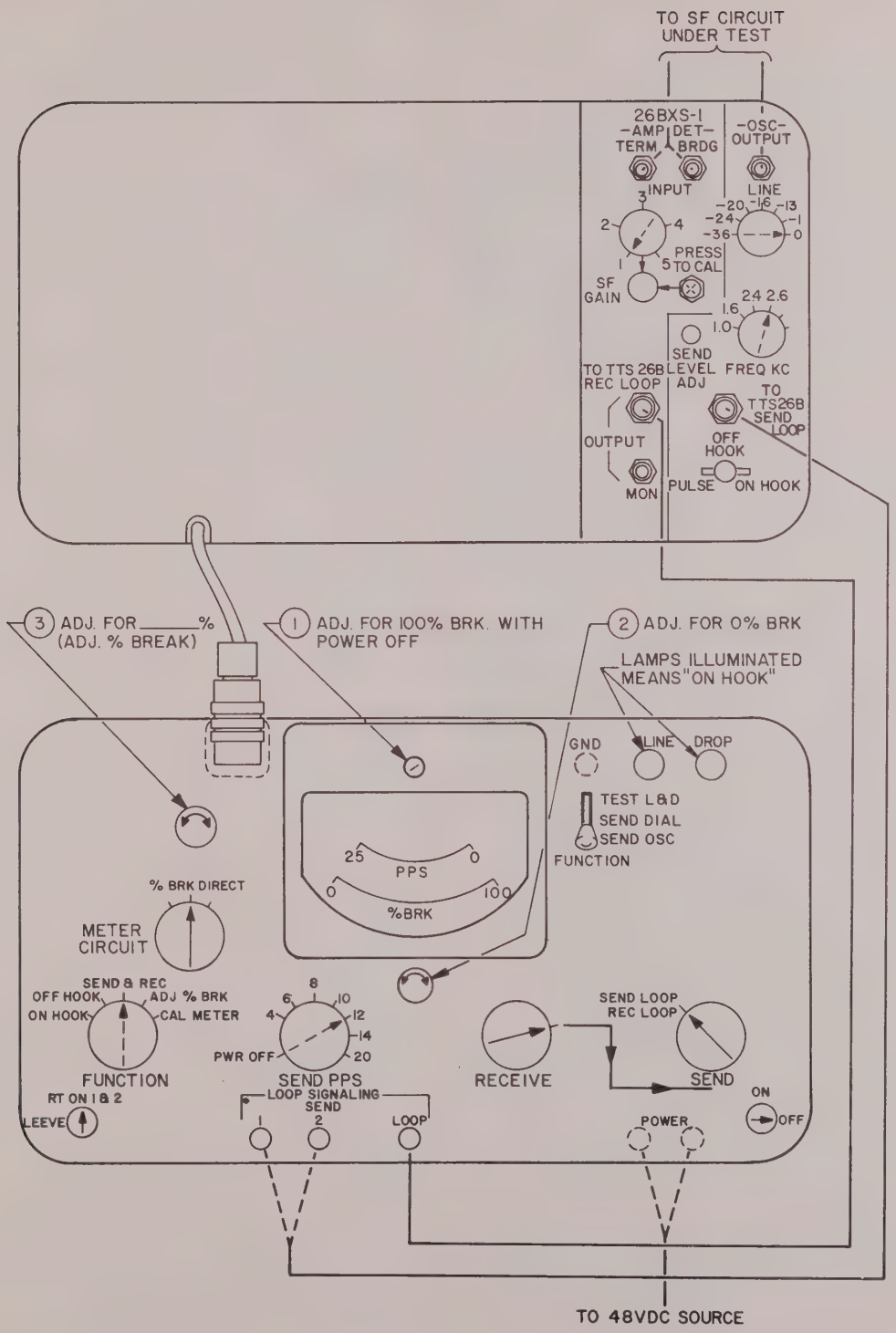


Figure 3—5. Typical Test Set Up.

SECTION 4

THEORY OF OPERATION

4.1 The TTS 26BXS-1 and TTS 26BXSR operate in an identical manner. The only difference is the physical configuration with resulting changes in reference designations. Since the two test panels are electronically almost identical, only the TTS 26BXS-1 test panel will be fully described. The similarities and differences between these test panels can be found by comparing Figure 4—1 with Figure 4—2. These Figures show the overall schematic diagrams for the two test panels.

4.2 The TTS 26BXSR test panel differs electronically from the TTS 26BXS-1 test panel only as follows.

a) The rack mounted test panel has an indicator lamp which lights when −48 Vdc is present and the FREQ KC switch is at any position other than PWR OFF.

b) The rack mounted test panel has terminal boards which permit parallel connections to the input and output jacks.

4.3 SEND SECTION CIRCUIT DESCRIPTION

4.4 The TTS 26BXS-1 send section consists of a transistorized oscillator keying unit and associated frequency determining networks, attenuator circuit, and output circuit. The circuit diagrams to which the following description applies are shown in Figures 4—1 and 4—3.

4.5 A bridged-T type rc oscillator, of three transistor stages, is used. The first two transistors are directly coupled from the collector of Q1 to the base of Q2. The positive feedback path is completed from the emitter of Q2, back through a blocking capacitor and resistance lamps (utilized for level stabilization), to the emitter of Q1. A part of Q1's emitter resistance is variable to allow setting the correct amount of positive feedback necessary for stable operation.

4.6 A negative feedback which is greater than the positive feedback is supplied to the base of Q1 through a null selective network and an emitter follower. At its tuned frequency, the selective bridged-T null network decreases the negative feedback sufficiently to permit oscillation to occur at the frequency determined by the rc values employed within the network. This frequency determining network consists of capacitors C3 and C4, and the resistors associated with FREQ KC switch S1.

4.7 The keying circuit consists of transistor stage Q4 which is operated as an emitter follower. The base of Q4 is coupled to the emitter of Q2 through resistor R7. Resistor R7 provides adequate decoupling to allow the keying stage to be turned on and off without adverse effects to the oscillator. Keying is accomplished by applying ground to, or removing ground from, the base of Q4; capacitor C6 provides dc blocking for the keying circuit. The output signal of the oscillator keyer unit, appearing across emitter load resistor R15, is coupled to the primary winding of output transformer T1 through dc blocking capacitor C7. Resistor R3 and capacitor C2 in the secondary winding of the output transformer provide for the impedance buildout and dc blocking of the output circuit.

4.8 The output level of the oscillator keyer unit is controlled by the setting of OUTPUT LEVEL switch S2. Depending on the setting of S2, a portion of the ac voltage appearing at the base of Q4 is shunted to ground to provide the exact output level to correspond with the setting of switch S2.

4.9 Key switch S4 establishes on hook and off hook supervision. In the ON HOOK position, pulsing circuits connected to "TO TTS 26B SEND LOOP" jack J6 are removed from the keying circuit of Q4. This establishes an on hook (steady tone) condition. The OFF HOOK position of S4 disconnects the pulsing circuit applied to jack J6 and, in addition, applies ground to the keying circuit of Q4. This establishes an off hook (no tone) condition. The PULSE position of S4 switches the keying circuit of Q4 through to the pulsing circuits connected into jack J6. In operation, J6 is normally patched to the SEND LOOP jack of a TTS 26B series test set.

4.10 Resistors R1 and R2 on component board CB1 provide voltage division, capacitor C1 provides decoupling, and zener diode CR1 provides regulation of the battery voltage. Zener diode CR1 regulates at approximately 24 volts. This regulation is necessary in order to achieve a uniform envelope of the SF tone output while being pulsed.

4.11 RECEIVE SECTION CIRCUIT DESCRIPTION

4.12 The major portion of the receive section consists of the SF detector printed circuit board. See Figure 4—4 in addition to Figure 4—1.

4.13 A received signal is coupled to amplifier stage Q1 via input transformer T1. Capacitors C1 and C12 provide dc blocking for the input circuit. There are two jacks associated with the input, J1 and J2. Capacitor C13 and resistor R22 are normally connected across the tip and ring of J1 to provide the 600 ohm input termination.

BRIDGE jack J2 is equipped with interrupter contacts to remove this termination when jacking into J2.

4.14 Variable resistor R1, connected across the secondary of T1, serves as the calibration control. The arm of this control is coupled to the base of amplifier stage Q1 through dc blocking capacitor C2. The output signal of amplifier stage Q1, which appears across collector load resistor R5, is coupled to the base of amplifier stage Q2 through dc blocking capacitor C4. The output of this stage is, in turn, coupled to amplifier stage Q3 through resistor R10 and dc blocking capacitors C5 and C6. Diodes CR2 and CR3 serve as a varistor or clamping circuit to supply the AGC required to prevent amplifier stage Q3 from being driven into saturation. This circuit is necessary in order to insure that the % break of the dc output pulsing is equal to that of the incoming SF signaling.

4.15 The output of amplifier stage Q3 is coupled to transformer T2 through dc blocking capacitor C7. The secondary winding of T2 connects to diodes CR4-CR7, which serve as a full wave bridge rectifier. The dc output of this bridge is connected to the base of Q4. Resistor R17, which connects between the base of Q4 and negative battery, provides bias to retain Q4 in an on condition. Q4, being normally in an on condition, holds relay K1 in an operated condition. Thus, with no signal input, the contacts of relay K1 are closed or in a so-called off hook condition. When an SF tone is applied to the input of the detector unit, a positive voltage is developed across the output of the bridge rectifier, which turns Q4 off to release relay K1.

4.16 The calibration required to normalize the detector circuit to the input level is accomplished through the operation of PRESS TO CAL switch S3 and its associated circuit. S3, in the operate position, connects the contacts of relay K1 to the tip and ring of jacks J3 and J4. This tip and ring circuit is normally extended to the receive circuit of the associated TTS 26B. MON jack J4, in parallel with J3, is provided for the operation of an external recorder such as a Brush or pen recorder. The CAL position of S3 switches the contacts of relay K1 to calibration lamp DS1. Another set of contacts on S3 applies ground to R11 which is in the base circuit of amplifier stage Q3. This shunts a portion of the ac voltage appearing at this point to ground. The normal calibration procedure is to advance SF GAIN control R1 to a point where relay K1 just starts to follow the incoming SF pulsing. At this point CAL switch S3 is released to the operate position, returning the relay contacts to the output jacks and removing ground from the ac shunting resistor R11. The removal of ground from resistor R11 increases the output of amplifier stage Q3 several dB above the threshold point thus, proper level normalization is achieved.

4.17 Capacitor C11 and resistors R20 and R21 provide voltage division and decoupling for the battery circuit. Diode CR1 provides protection should improper polarity of the battery circuit be applied. Resistors R18 and R19 serve as a voltage divider for the relay driving stage. Diode CR8 across the winding of relay K1 protects transistor Q4 from high voltage spikes developed across the coil of relay K1. Capacitors C3 and C8 provide ac bypass for the associated amplifier stages. A relatively high degree of 60 cycle attenuation is achieved through the selection of the values for the various coupling capacitors.

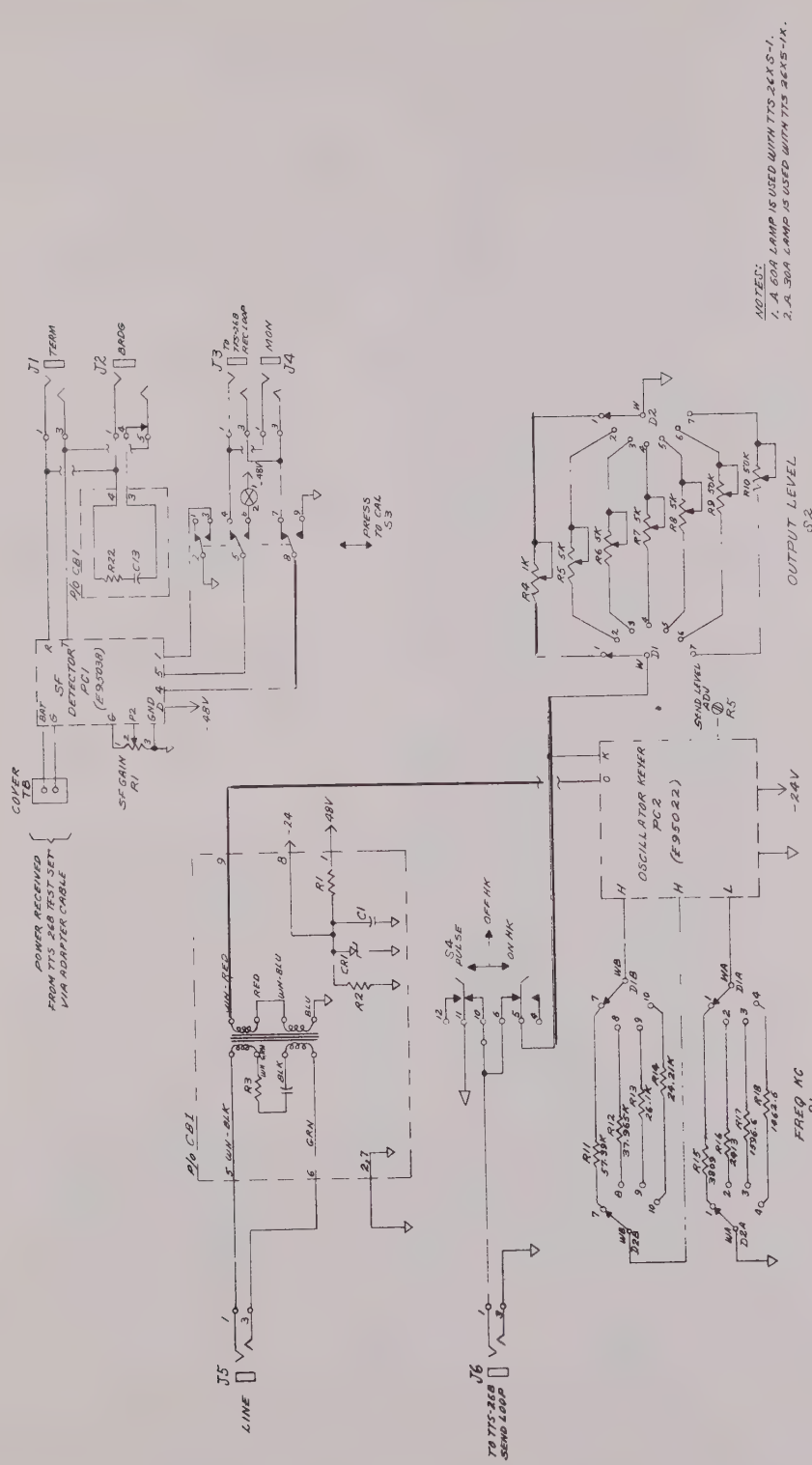


Figure 4—1. TTS 26BXS-1 Overall Schematic Diagram.

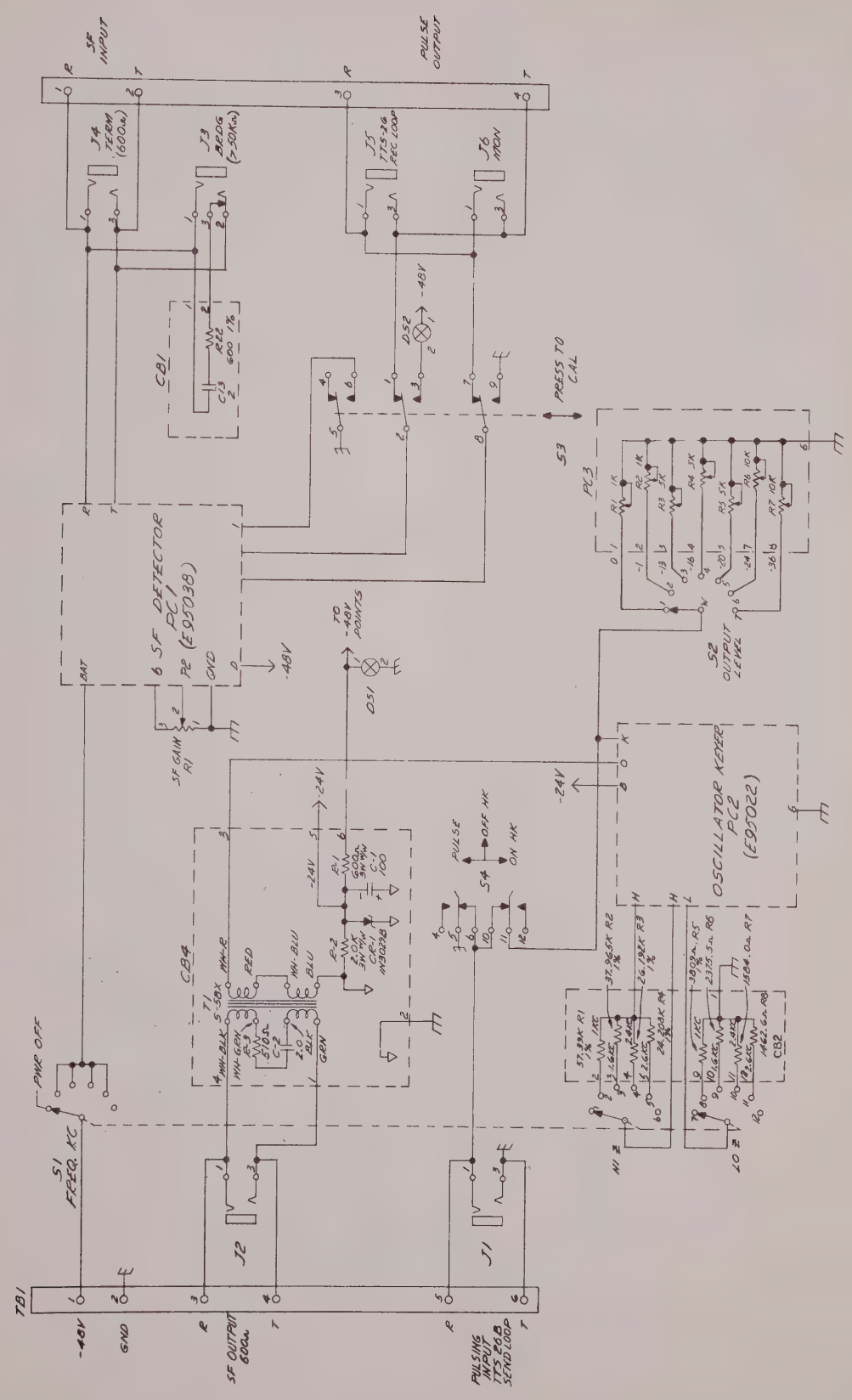


Figure 4—2. TTS 26BXSR Overall Schematic Diagram.

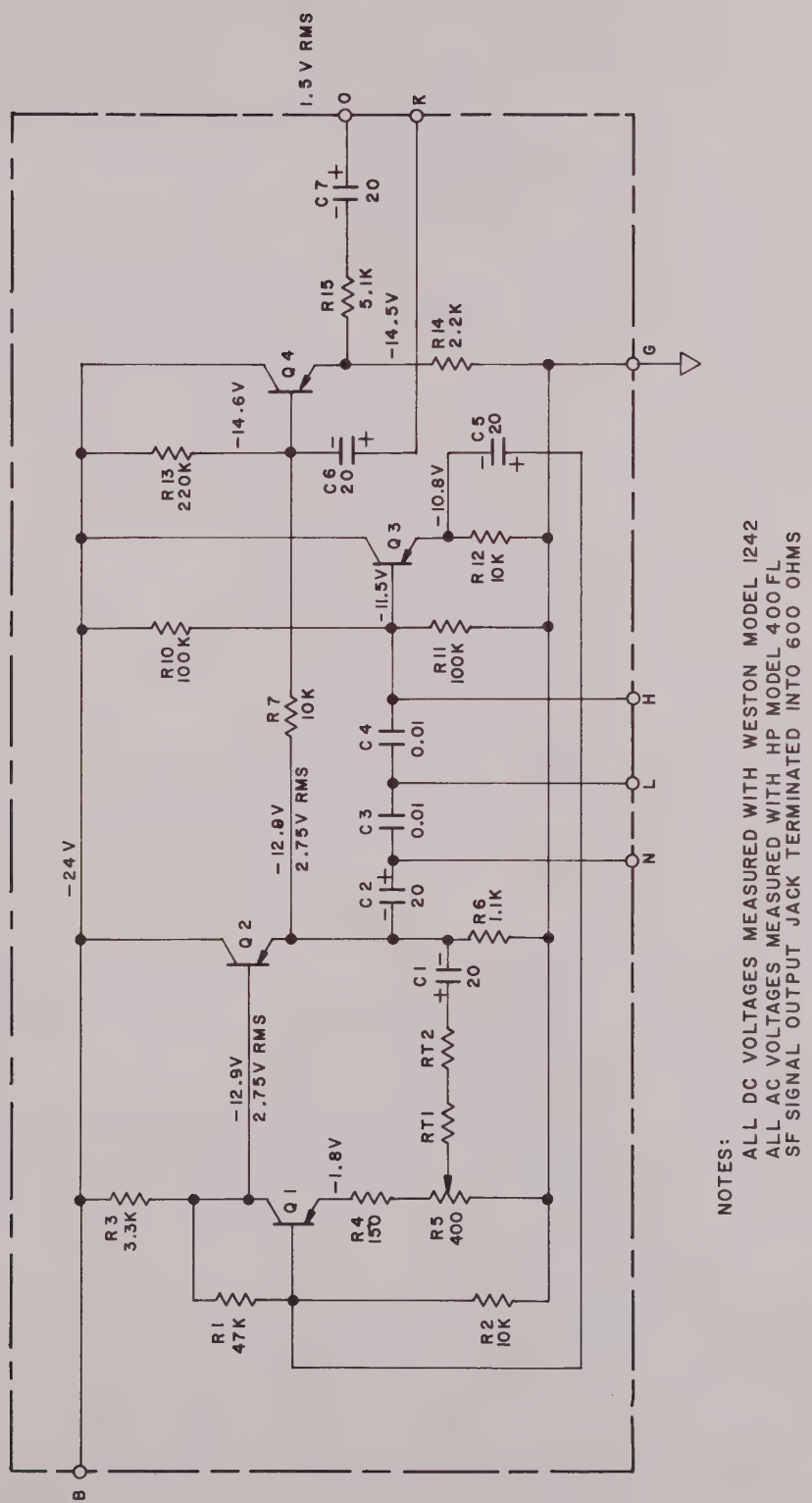


Figure 4—3. Oscillator Keyer Schematic Diagram.

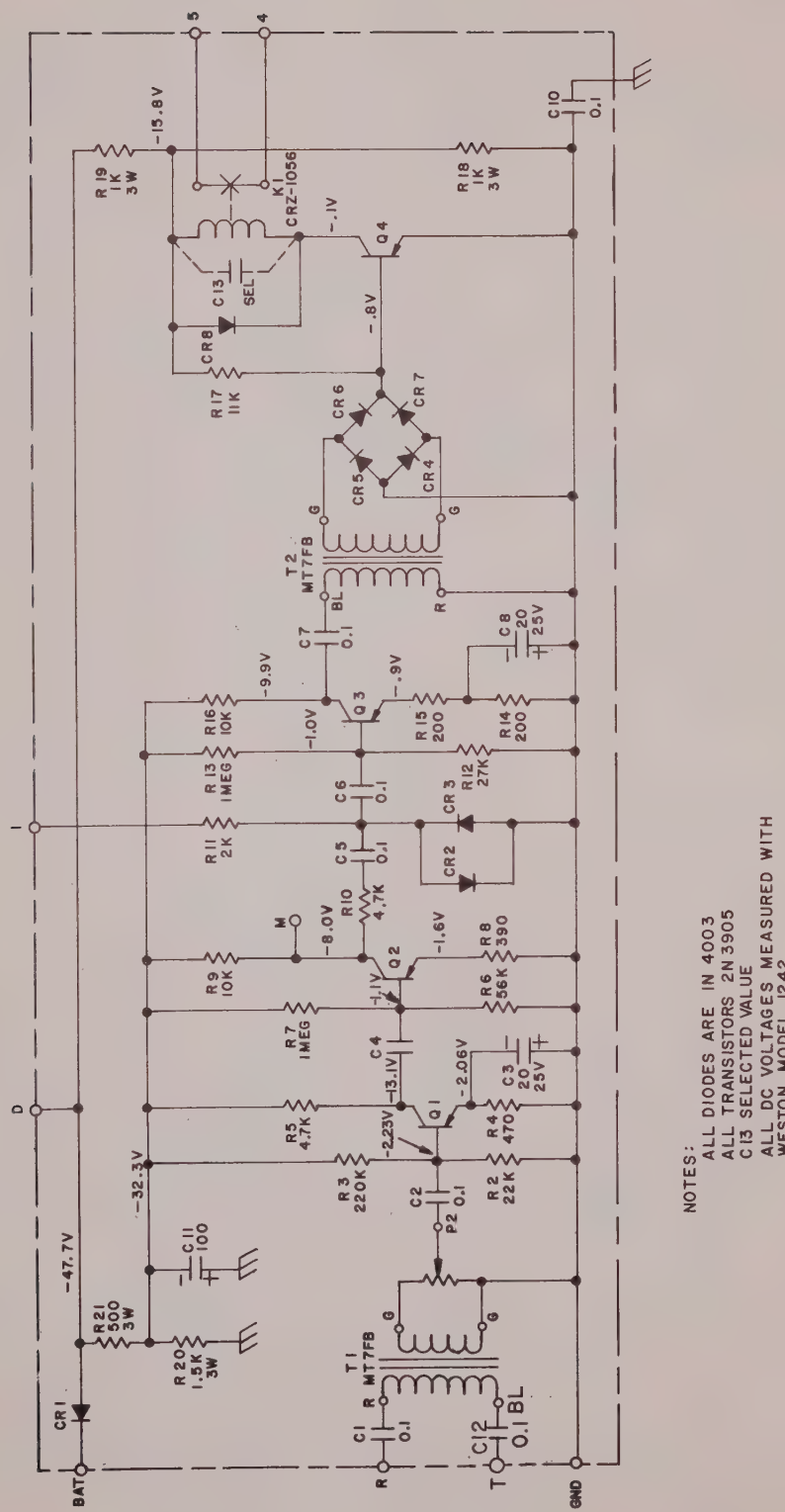


Figure 4—4. SF Detector Schematic Diagram.

SECTION 5

MAINTENANCE

5.1 The test panels require no special maintenance other than periodic checks of the send levels. Reasonable care to keep connectors and switch contacts clean is the only preventive maintenance needed.

5.2 The basic test equipment needed to service this unit should include an oscilloscope plus a dc and ac voltmeter. The theory of operation, including the detailed schematic diagrams, should assist repair personnel in troubleshooting the test panels.

5.3 SEND LEVEL CHECK

1) Set up the test panel for normal operation.

2) Connect a 600-ohm load across the input of an ac voltmeter such as HP 400FL.

3) Patch the SF signal output jack to the ac voltmeter input.

4) Set test panel key switch at ON HOOK.

5) For each position of the OUTPUT LEVEL switch, observe that the ac voltmeter reading is within ± 0.1 dB of the specified output level.

NOTE

It may be possible to bring the TTS 26BXS-1 within tolerance by adjusting SEND LEVEL ADJ control (recessed screw driver adjustment).

6) If the send levels do not meet the tolerance specifications, do the send level calibration outlined in paragraph 5.4.

5.4 SEND LEVEL CALIBRATION

5.5 The send level calibration requires the following equipment:

a) Ac Voltmeter HP400FL or equivalent

b) 600 ohm load

c) Oscilloscope

5.6 TTS 26BXS-1 CALIBRATION SET UP

1) Remove the test panel from the accessory cover and disconnect the power lead from the cover terminal board.

2) Loosen component board CB1.

3) Connect a 48 Vdc source to the test panel (ground on black lead and −48 Vdc on red lead).

4) Connect 600-ohm load across ac voltmeter input binding posts.

5) Patch test panel LINE jack to ac voltmeter input binding posts.

6) Connect ac voltmeter input binding posts to oscilloscope input jack.

7) Set potentiometer R4 (mounted on OUTPUT LEVEL switch S2) to mid-range.

8) Turn on 48 Vdc power source and test equipment.

9) On test panel, set key switch at ON HOOK. Allow several minutes warm-up time.

10) Proceed to the calibration procedure of paragraph 5.7.

5.7 TTS 26BXS-1 CALIBRATION PROCEDURE

1) On test panel, set OUTPUT LEVEL switch at 0.

2) Adjust SEND LEVEL ADJ potentiometer R5 to obtain 0 ± 0.2 dBm on the voltmeter. (Screw driver adjustment accessible through hole in front panel.)

3) Observe that no distortions appear on the wave shape displayed by the oscilloscope.

4) Slowly increase the send level to + 0.6 dBm and observe that distortions do not appear until after exceeding the + 0.5 dBm level.

NOTE

If distortions do occur before reaching + 0.5 dBm, change resistor R7 of oscillator keyer PC2 to a lower value.

6) Fine adjust potentiometer R4 (mounted on OUTPUT LEVEL switch S2) to obtain 0 ± 0.1 dBm.

5) Readjust SEND LEVEL ADJ potentiometer R5 to obtain −1 ± 0.2 dBm.

7) Set OUTPUT LEVEL switch at −1.

8) Fine adjust potentiometer R5 (on OUTPUT LEVEL switch) to obtain −1 ± 0.1 dBm.

9) Repeat fine adjustment for all other OUTPUT LEVEL positions. Refer to Table 5−1 for potentiometer to adjust at each position. The tolerance is ± 0.1 dB.

10) Shut off the 48 Vdc source and test equipment. Disconnect calibration set up.

11) Replace component board CB1.

12) Reconnect the TTS 26BXS-1 test panel to the accessory cover terminal board and resecure test panel to cover.

Table 5−1. Level Adjustment Controls

OUTPUT LEVEL	TTS 26BXS-1	TTS 26BXSR
	POTENTIOMETERS MOUNTED ON OUTPUT LEVEL SWITCH S2	POTENTIOMETERS MOUNTED ON PRINTED CIRCUIT PC3
0	R4	R1
−1	R5	R2
−13	R6	R3
−16	R7	R4
−20	R8	R5
−24	R9	R6
−36	R10	R8

5.8 TTS 26BXSR CALIBRATION SET UP

1) Remove dust cover.

2) Connect a 48 Vdc source to the test panel (ground on TBI-2 and −48 Vdc on TBI-1).

3) Connect 600-ohm load across ac voltmeter input binding posts.

4) Patch test panel SF OUTPUT jack to ac voltmeter input binding posts.

5) Connect ac voltmeter input binding posts to oscilloscope input jack.

6) Set potentiometer R1 (mounted on printed circuit PC3) to mid-range.

7) Turn on 48 Vdc power source, test panel, and test equipment.

8) On test panel, set key switch at ON HOOK. Allow several minutes warm-up time.

9) Proceed to the calibration procedure of Paragraph 5.9.

5.9 TTS 26BXSR CALIBRATION PROCEDURE

1) On test panel, set OUTPUT LEVEL switch at 0.

2) Adjust send level potentiometer R5 to obtain 0 ± 0.2 dBm on the voltmeter. (Potentiometer mounted on oscillator keyer PC2.)

3) Observe that no distortions appear on the wave shape displayed by the oscilloscope.

4) Slowly increase the send level to + 0.6 dBm and observe that distortions do not appear until after exceeding the + 0.5 dBm level.

NOTE

If distortions do occur before reaching + 0.5 dBm, change resistor R7 of oscillator keyer PC2 to a lower value.

5) Readjust send level potentiometer R5 to obtain 0 ± 0.2 dBm.

6) Fine adjust potentiometer R1 (mounted on printed circuit PC3) to obtain 0 ± 0.1 dBm.

7) Set OUTPUT LEVEL switch at −1.

8) Fine adjust potentiometer R2 to obtain −1 ± 0.1 dBm.

9) Repeat fine adjustment for all other OUTPUT LEVEL positions. Refer to Table 5−1 for potentiometer to adjust at each position. The tolerance is ± 0.1 db.

10) Shut off the 48 Vdc power source the test panel and test equipment. Disconnect calibration set up.

11) Replace dust cover.

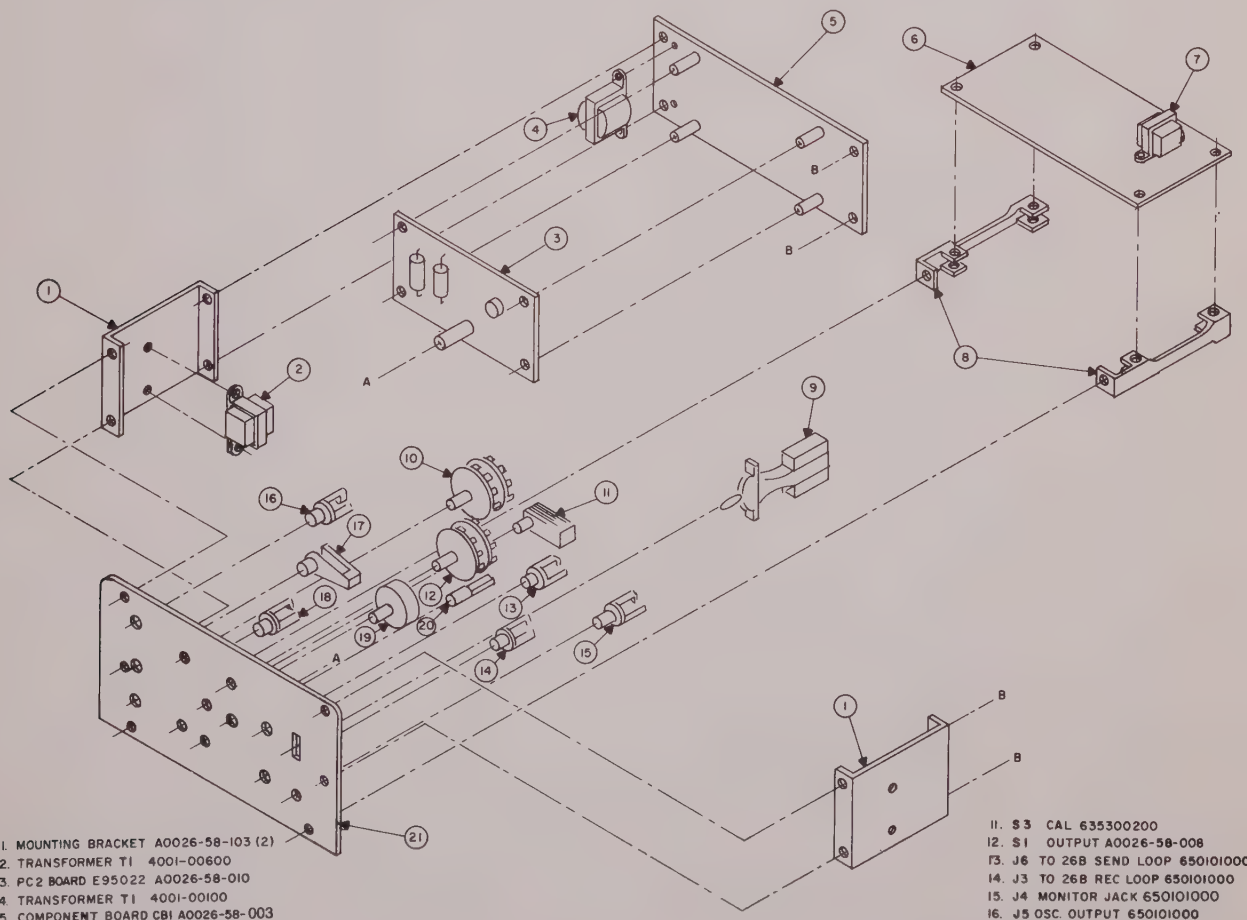
SECTION 6

ELECTRONIC PARTS LISTS

6.1 This section provides the parts lists and associated component location diagrams. Figures 6—1 through 6—7 and Tables 6—1 through 6—6 cover the TTS 26BXS-1 while Figures 6—8 through 6—13 and Tables 6—6 through 6—11 pertain to the TTS 26BXSR.

Table 6—1. TTS 26BXS-1 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
CB1	CB-1						A002658003
DS1	T-2 SLIDE BASE				SYL	60A	730000200
J1	JACK,TEL,SWCRFT SCHEM 4				SWCRFT	12B	650101000
J2	JACK,WE-310 ACCEPTANCE				SWCRFT	C-54B	650200400
J3-6	JACK,TEL,SWCRFT SCHEM 4				SWCRFT	12B	650101000
PC1	E-95038 PC BD						A002658009
PC2	PC BRD ASSY E95022						A002658010
R1	10K	2W	10%		OHMITE	CU-1031	232001030
S1	S-1						A002658008
S2	SWITCH 2 TTS-26BXS-1						A002658007
S3	3PDT				SWCRFT	NF4009	635300200
S4	2C-2C CONTACT				S CARLSON	173N	630100600
T2	P25K S1200 CT MINI				MICROTRAN	MT-7FB	400100600
XDS1	LAMP HOLDER,GREEN				DIALCO	105-4428-0722-200	828000200



1. MOUNTING BRACKET A0026-58-103 (2)
2. TRANSFORMER T1 4001-00600
3. PC2 BOARD E95022 A0026-58-010
4. TRANSFORMER T1 4001-00100
5. COMPONENT BOARD CB1 A0026-58-003
6. PC1 BOARD E95038 A0026-58-009
7. TRANSFORMER T2 4001-00600
8. MOUNTING BRACKET 8100-00400 (2)
9. S4 REC LOOP 630100600
10. S2 LINE A0026-58-007
11. S3 CAL 635300200
12. S1 OUTPUT A0026-58-008
13. J6 TO 26B SEND LOOP 650101000
14. J3 TO 26B REC LOOP 650101000
15. J4 MONITOR JACK 650101000
16. J5 OSC. OUTPUT 650101000
17. J2 BRIDGE 650200400
18. J1 TERM 650101000
19. R1 232001030
20. DS1 LAMP 730000200
21. FRONT PANEL B0026-58-002

Figure 6—1. TTS 26BXS-1 Exploded View.

Table 6—2. SF Detector Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
C1-2	.1UF		00	75V	CENTRALAB	DDA-104	330201040
C3	20UF			25V	C. DUBILIE	NLW-20-25	300902060
C4	.01UF	Z5UTC	GMV	1KV	CENTRALAB	DD-103	330101030
C5-7	.1UF		00	75V	CENTRALAB	DDA-104	330201040
C8	20UF			25V	C. DUBILIE	NLW-20-25	300902060
C9	.15UF		10%	100V	SPRAGUE	225P15491XD3	320001540
C10	.1UF		00	75V	CENTRALAB	DDA-104	330201040
C11	100UF			50V	C. DUBILIE	NLW-100-50	300901072
C12	.1UF		00	75V	CENTRALAB	DDA-104	330201040
C13	SELVAL		10%		SPRAGUE	225P	320000000
CR1-8	D041			200V	EDAL	1N4003	560040030
K1	.95K				CLARE	CRZ-1056T	602300100
Q1-4	TO92MSS	310MW		40V	MOTOROLA	2N3905	552039050
R2	22K	1/2W	5%		AB	TYPE EB	200202235
R3	220K	1/2W	5%		AB	TYPE EB	200202245
R4	470-	1/2W	5%		AB	TYPE EB	200204715
R5-10	4.7K	1/2W	10%		AB	TYPE EB	200204726
R6	56K	1/2W	10%		AB	TYPE EB	200205636
R7	1M	1/2W	10%		AB	TYPE EB	200201056
R8	390-	1/2W	10%		AB	TYPE EB	200203916
R9	10K	1/2W	5%		AB	TYPE EB	200201035
R11	2K	1/2W	5%		AB	TYPE EB	200202025
R12	56K	1/2W	10%		AB	TYPE EB	200205636
R13	1M	1/2W	10%		AB	TYPE EB	200201056
R14-15	200-	1/2W	5%		AB	TYPE EB	200202015
R16	10K	1/2W	5%		AB	TYPE EB	200201035
R17	11K	1/2W	5%		AB	TYPE EB	200201135
R18-19	1K	3W	5%		W LEONARD	TYPE 3X	210301025
R20	1.5K	3W	5%		W LEONARD	TYPE 3X	210301525
R21	500#	3W	5%		W LEONARD	TYPE 3X	210305015
T2	P25K S1200 CT MINI				MICROTRAN	MT-7FB	400100600

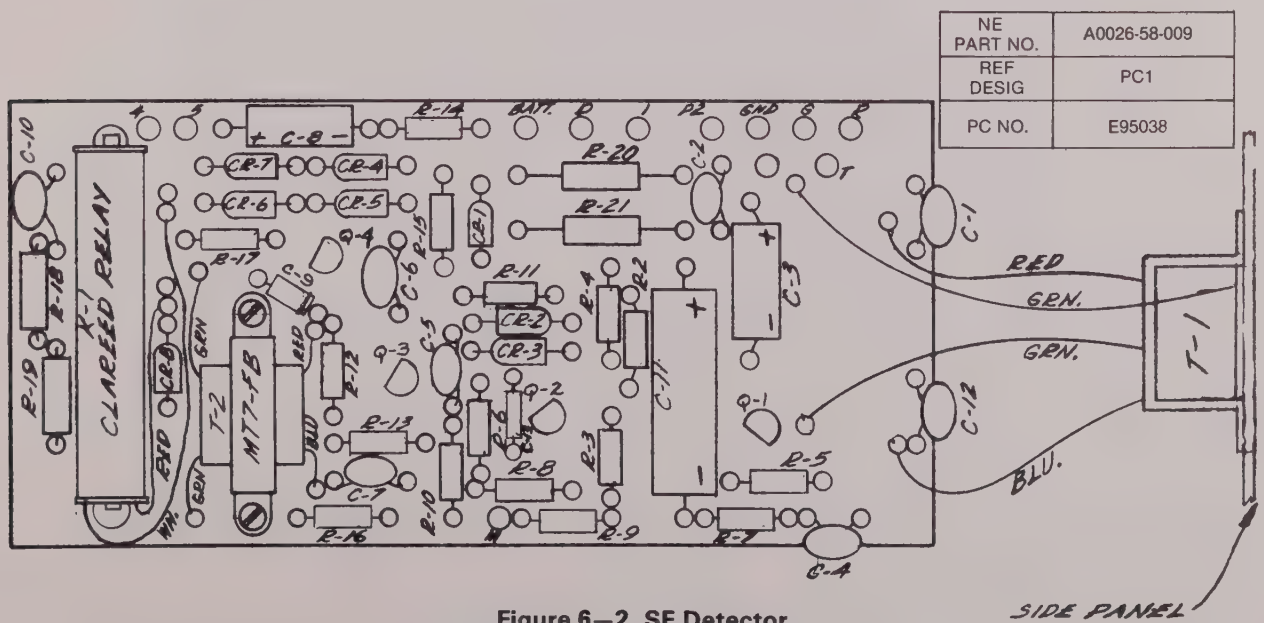


Figure 6—2. SF Detector.

Table 6—3. Oscillator Keyer Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
C1-2	20UF			25V	C. DUBILIE	NLW-20-25	300902060
C3-4	.0096UF		5%	100V	F-DYNE	PS11-.0096-100-5	321509620
C5-7	20UF			25V	C. DUBILIE	NLW-20-25	300902060
Q1-2	TO5AFC	250MW		45V	TI	2N1375	553013750
Q3	TO92MSS	310MW		40V	MOTOROLA	2N3905	552039050
Q4	TO5AFC	250MW		45V	TI	2N1375	553013750
R1	47K	1/2W	10%		AB	TYPE EB	200204736
R2	10K	1/2W	10%		AB	TYPE EB	200201036
R3	3.3K	1/2W	10%		AB	TYPE EB	200203326
R4	150-	1/2W	10%		AB	TYPE EB	200201516
R5	400#	2W	10%		CLAROSTAT	CM22425NP	230804010
R6	1.1K	1/2W	5%		AB	TYPE EB	200201125
R7	10K	1/2W	5%		AB	TYPE EB	200201035
R10-11	100K	1/2W	10%		AB	TYPE EB	200201046
R12	10K	1/2W	10%		AB	TYPE EB	200201036
R13	47K	1/8W	10%		AB	TYPE BB	200004736
R14	2.2K	1/2W	5%		AB	TYPE EB	200202225
RT1-2	LAMP,WEIN BRIDGE				SYLVANIA	SEE DWG	730100301

NE PART NO.	A0026-58-010
REF DESIG	PC2
PC NO.	E95022

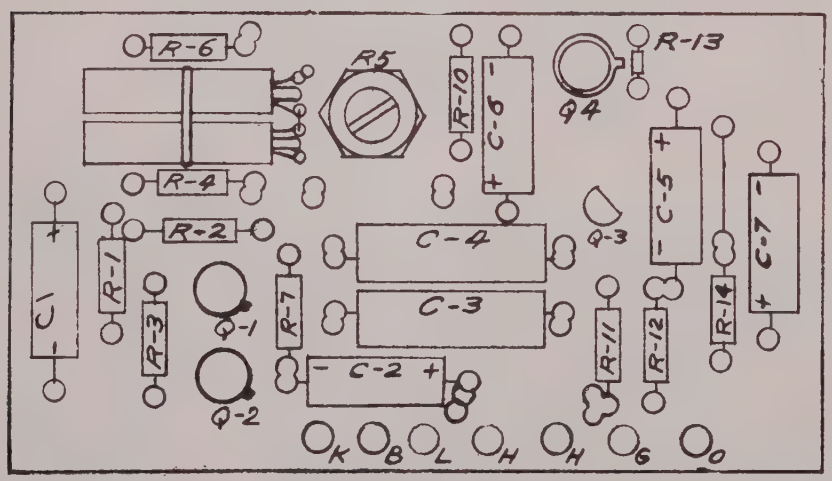


Figure 6—3. Oscillator Keyer.

Table 6—4. FREQ KC Switch S1 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
R11	57.39K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220257321
R12	37.965K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220237921
R13	26.1K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220226121
R14	24.21K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220224221
R15	3809-	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220238011
R16	2413-	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220224111
R17	1.5966K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220215911
R18	1.4626K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220214611
S1	2D 2CKT 6POS NONSHORT				CRL	PA-2011	625200300

NE PART NO.	A0026-58-008
REF DESIG	S1
PC NO.	———

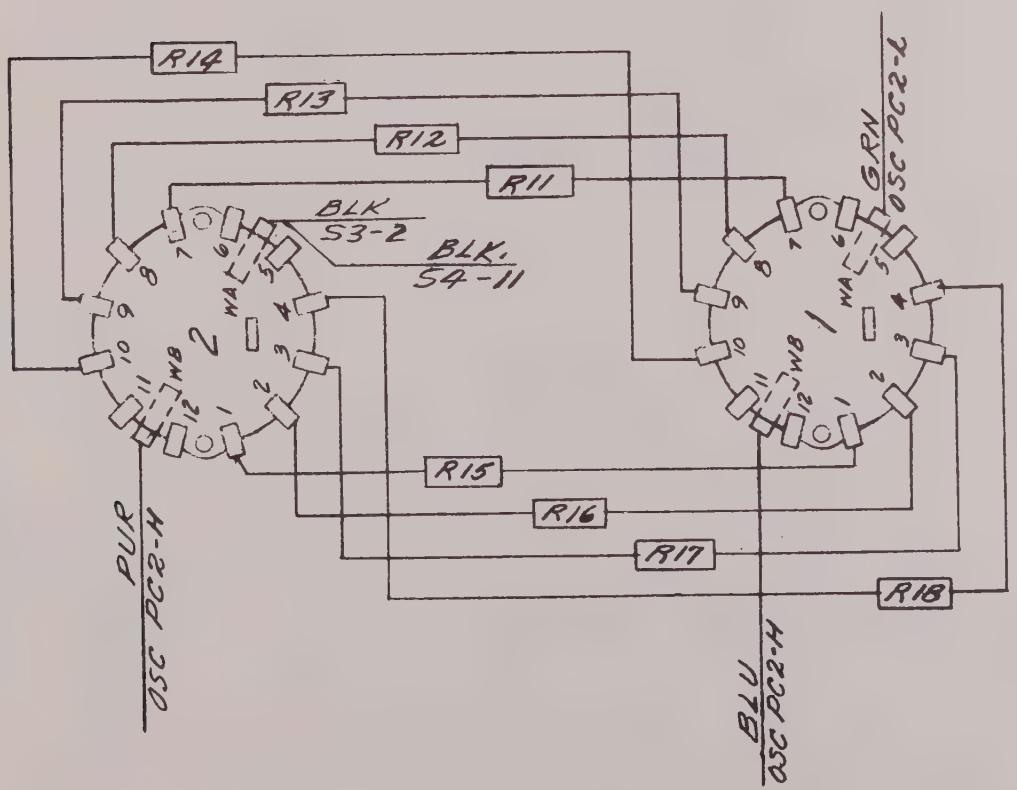


Figure 6—4. FREQ KC Switch S1.

Table 6—5. OUTPUT LEVEL Switch S2 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
R4	1K	.75W	10%		HELIPOT	89PR1K	232501020
R5	5K	.75W	10		HELIPOT	89PR5K	232505020
R6	5K	.75W	10		HELIPOT	89PR5K	232505020
R7	5K	.75W	10		HELIPOT	89PR5K	232505020
R8	5K	.75W	10		HELIPOT	89PR5K	232505020
R9	50K	.75W	10		HELIPOT	89PR50K	232505030
R10	50K	.75W	10		HELIPOT	89PR50K	232505030

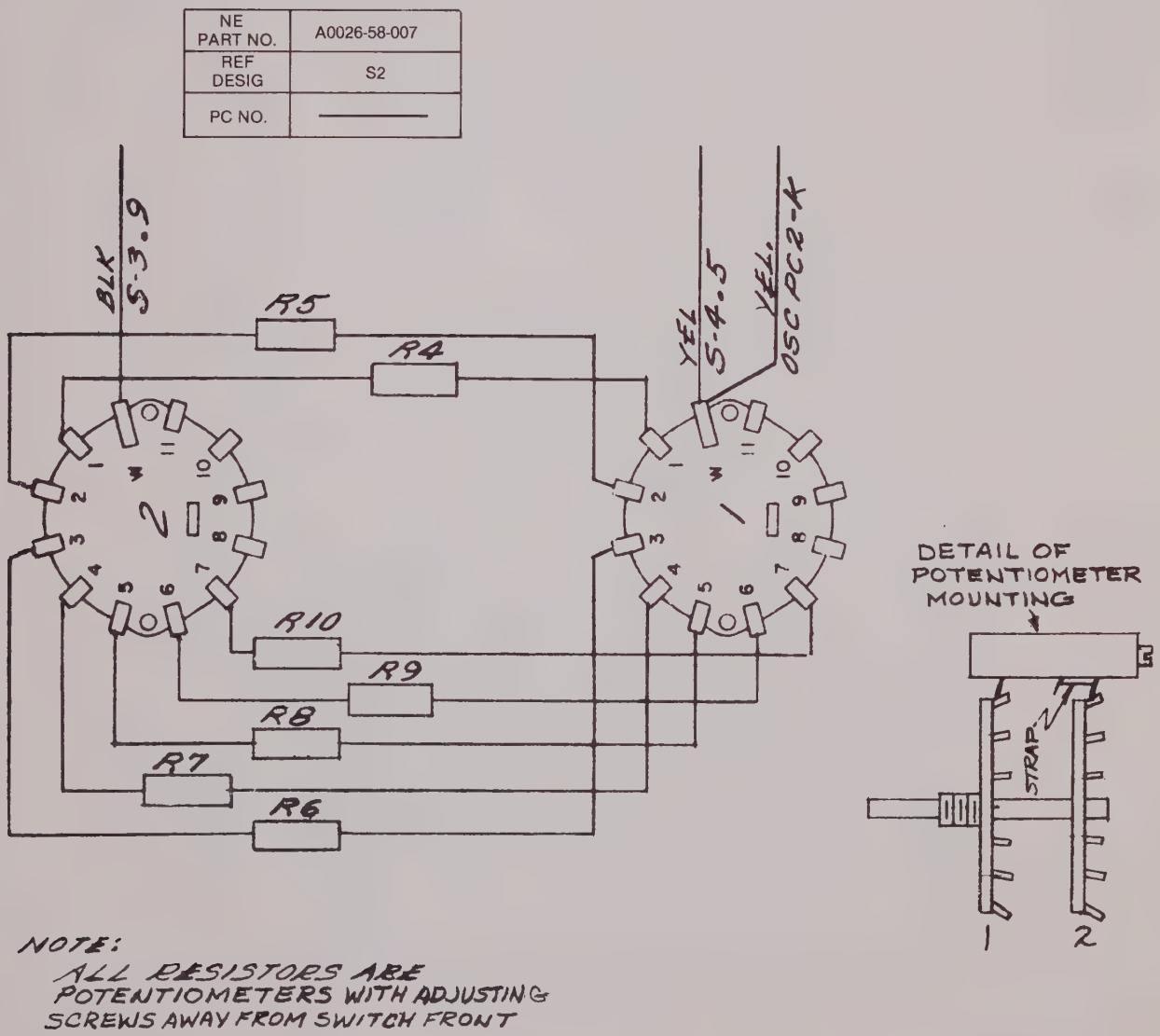
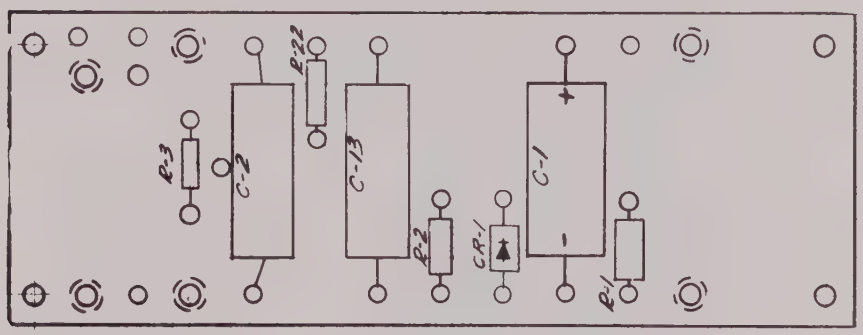


Figure 6—5. OUTPUT LEVEL Switch S2.

Table 6—6. Component Board CB1 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
C1	100UF			50V	C. DUBILIE	NLW-100-50	300901072
C2	2UF			200V	F-DYNE	MPE11-2.0-200-10	301302050
C13	2UF			200V	F-DYNE	MPE11-2.0-200-10	301302050
CR1	A31A	1W	5%	24V	DICKSON	1N3029B	562030292
R1	600#	3W	5%		W LEONARD	TYPE 3X	210306015
R2	2K	3W	5%		W LEONARD	TYPE 3X	210302025
R3	493-	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220249301
R22	600-	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220260001
T1	P600-150 S600-150				TRIAD	S-58X	400100100



NE PART NO.	A0026-58-003
REF DESIG	CB1
PC NO.	———

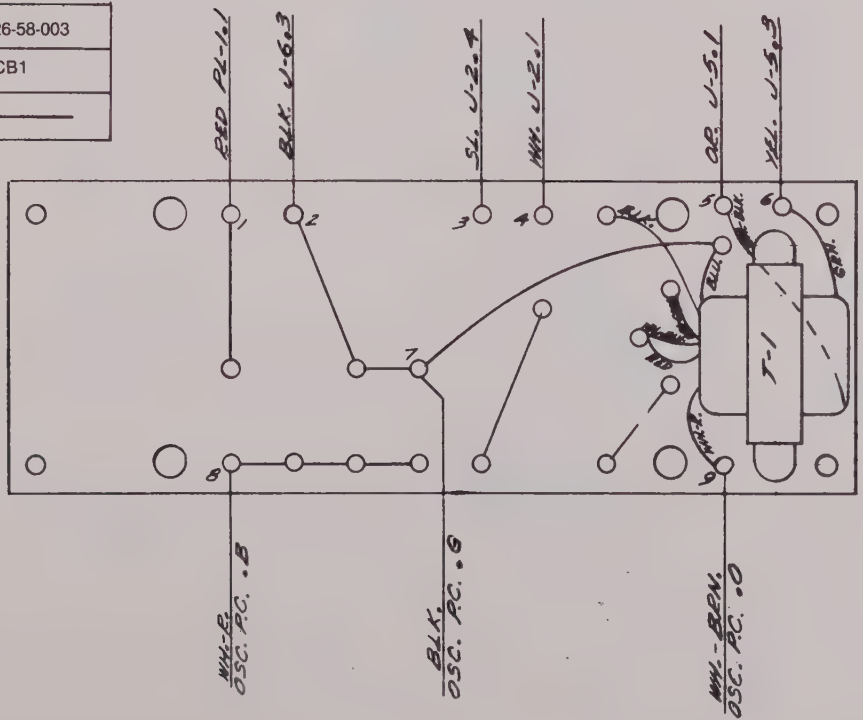
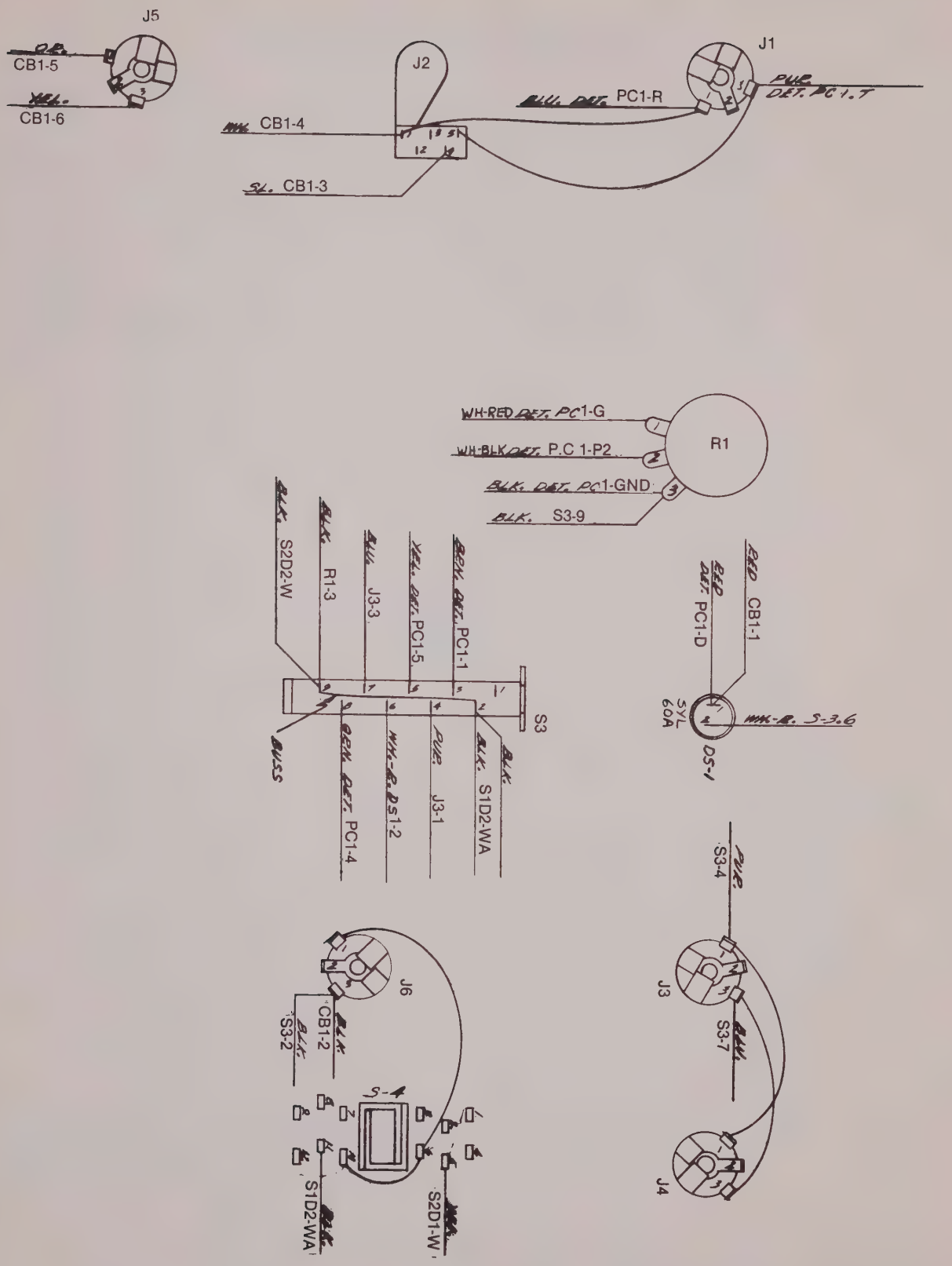


Figure 6—6. Component Board CB1.



NOTE: DS1-1 30A LAMP FOR USE WITH TTS 26BDL ONLY.

Figure 6—7. Wiring Diagram.

Table 6—7. TTS 26BXSR Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE POWER TOL VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
CB1	CB 1 ASSY + STRAPPING			A002659015
CB2	CB2 ASSY&STRAP			A002659017
CB4	CB 4 ASSY + STRAPPING			A002659018
DS1-2	T-2 SLIDE BASE	SYL	60A	730000200
J1-2	JACK,TEL,SWCRFT SCHEM 4	SWCRFT	12B	650101000
J3	JACK TEL SWCRFT SCHEM 8	SWCRFT	13B	650100500
J4-6	JACK,TEL,SWCRFT SCHEM 4	SWCRFT	12B	650101000
PC1	E-95038 PC BD			A002658009
PC2	PC BRD ASSY E95022			A002658010
PC3	ASSY+WIR 96292 PC3			A002659024
R1	10K 2W 10%	OHMITE	CU-1031	232001030
S1	2D 2CKT 6POS NONSHORT	CRL	PA-2011	625200300
S2	1D 1CKT 11POS NONSHORT	CRL	PA-1001	625101700
S3	3PDT	SWCRFT	NF4009	635300200
S4	2C-2C CONTACT	S CARLSON	173N	630100600
TB1-2	P25K S1200 CT MINI	MICROTRAN	MT-7FB	400100600
XDS1-2	LAMP HOLDER,GREEN	DIALCO	105-4428-0722-200	828000200

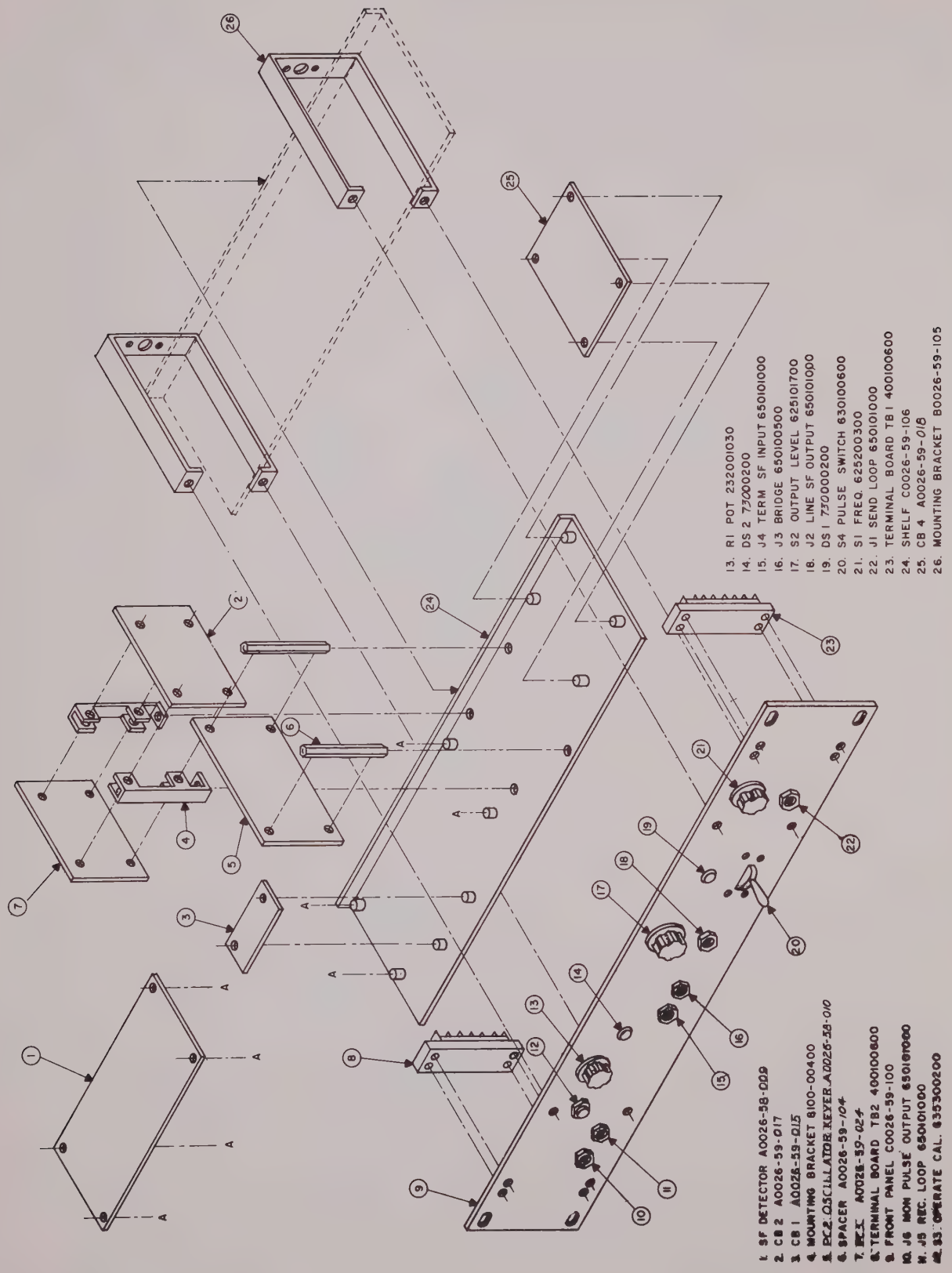


Figure 6—8. TTS 26BXSR Exploded View.

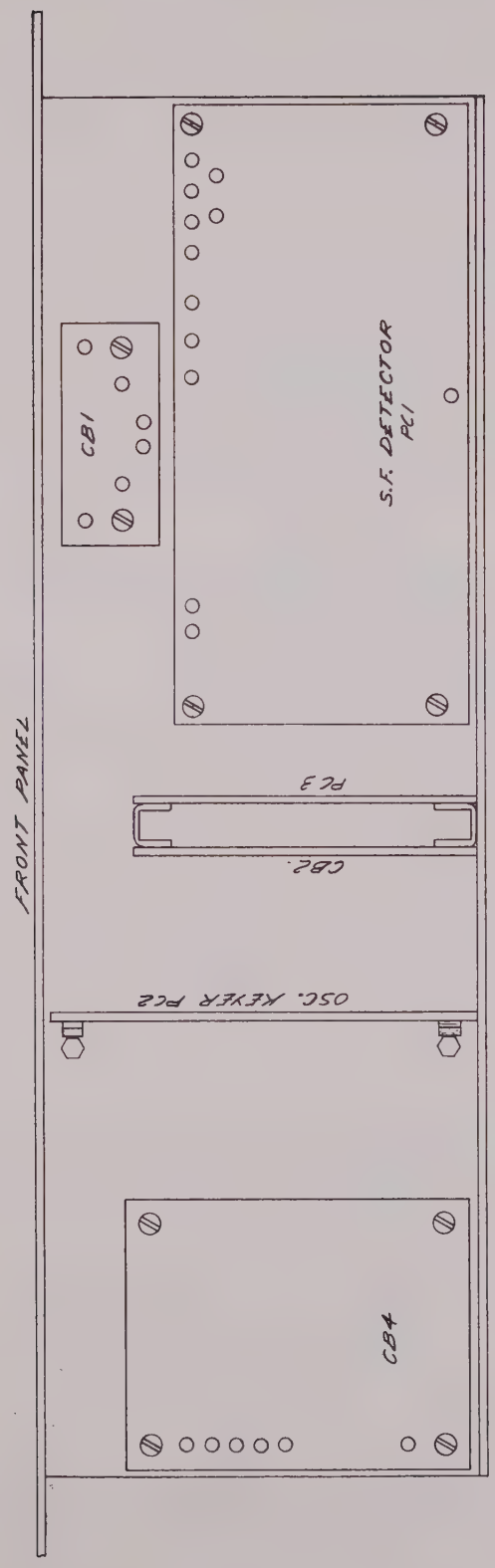
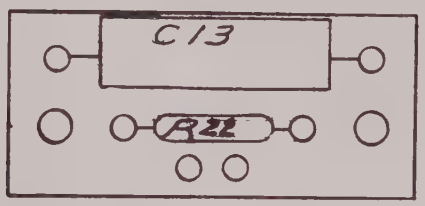


Figure 6—9. Board Location.

Table 6—8. Component Board CB1 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
C13	2UF			200V	F-DYNE	MPE11-2.0-200-10	301302050
R22	600-	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220260001

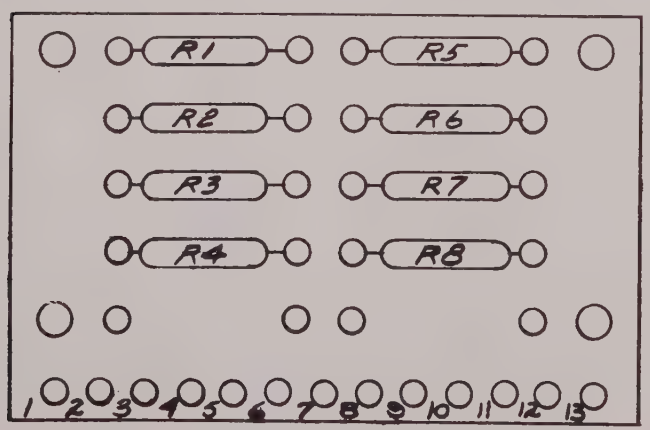


NE PART NO.	A0026-59-015
REF DESIG	CB1
PC NO.	———

Figure 6—10. Component Board CB1.

Table 6—9. Component Board CB2 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
R1	57.39K	1/8W	.5%		ELECTRA	RN55 SIZE 100 PPM	220357327
R2	37.965K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220237921
R3	26.1K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220226121
R4	24.21K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220224221
R5	3.809K	1/8W	.5%		ELECTRA	RN55 SIZE 100 PPM	220338017
R6	2413-	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220224111
R7	1.5966K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220215911
R8	1.4626K	1/8W	1%		ELECTRA	RN55 SIZE 100 PPM	220214611



NE PART NO.	A0026-59-017
REF DESIG	CB2
PC NO.	———

Figure 6—11. Component Board CB2.

Table 6—10. Printed Circuit PC3 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
R1-2	1K	.75W	10%		HELIPOT	89PR1K	232501020
R3-5	5K	.75W	10		HELIPOT	89PR5K	232505020
R6-7	50K	.75W	10		HELIPOT	89PR50K	232505030

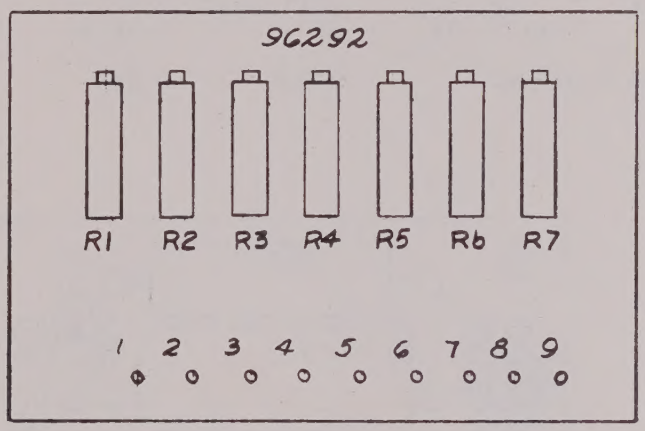
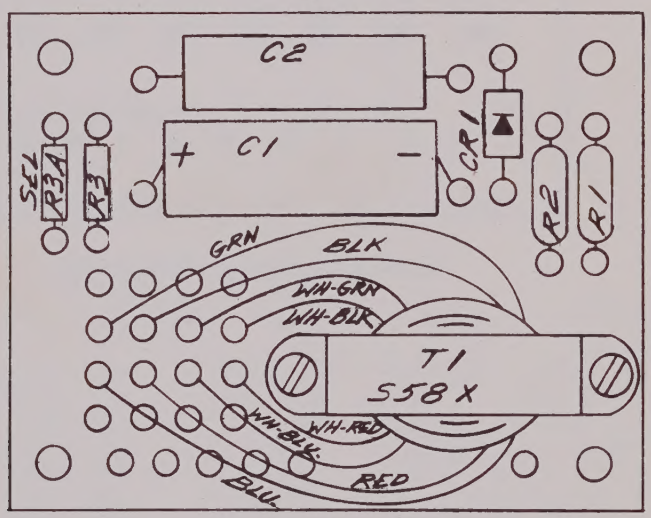


Figure 6—12. Printed Circuit PC3.

NE PART NO.	A0026-59-024
REF DESIG	PC3
PC NO.	E96292

Table 6—11. Component Board CB4 Parts List.

REFERENCE DESIGNATOR	DESCRIPTION VALUE	POWER	TOL	VOLTS	MFGR.	MFGR. PART NO.	N.E.C. PART NO.
C1	100UF			50V	SPRAGUE	TVA1310	300401070
C2	2UF			200V	F-DYNE	MPE11-2.0-200-10	301302050
CR1	A31A	1W	5%	24V	DICKSON	1N3029B	562030292
R1	600#	3W	5%		W LEONARD	TYPE 3X	210306015
R2	2K	3W	5%		W LEONARD	TYPE 3X	210302025
R3	510-	1/2W	5%		AB	TYPE EB	200205115
T1	P600-150 S600-150				TRIAD	S-58X	400100100



NE PART NO.	A0026-59-018
REF DESIG	CB4
PC NO.	———

Figure 6—13. Component Board CB4.